Braz Dent J (2003) 14(1): 63-66 ISSN 0103-6440

Orthopedic Cervical Headgear in Class II Treatment: Case Report

Carla ENOKI
Mírian Aiko Nakane MATSUMOTO
José Tarcísio Lima FERREIRA

Discipline of Orthodontics, Faculty of Dentistry of Ribeirão Preto, University of São Paulo, Ribeirão Preto, SP, Brazil

Early treatment for Class II malocclusion was undertaken with the objective of correcting skeletal disproportion by altering the growth pattern. A case of Class II, Division 1 malocclusion in the mixed dentition was corrected to Class I molar relationship using orthopedic cervical headgear, with nonextraction edgewise therapy. Cephalometric analysis indicated a reduction in the maxillomandibular discrepancy (ANB) correcting the Class II malocclusion to Class I malocclusion. The treatment showed that this was achieved by downward displacement and inhibition of the forward growth of the maxilla and growth of the mandible. There was no downward rotation of the mandible nor maxillary first molar extrusion. There was improvement in the jaw relationship.

Key Words: Class II malocclusion, cervical headgear, extraoral traction, growth.

INTRODUCTION

Many investigations (1,2) have been carried out to evaluate the possibilities of growth modification with orthopedic appliances, heavy forces that tend to displace the teeth within the bone (3). Class II malocclusion treatment is frequently initiated in the mixed dentition (4,5), where the principal objective is the reduction of the overjet. The patients are, on the whole, cooperative, and the tissues readily respond to mechanical deformation and remodel at a faster rate at this age (1). The timing of cervical headgear treatment on the basis of skeletal maturation is a more significant means of obtaining the best desirable orthopedic effect. This should be based on hand-wrist films rather than on chronologic age (6).

In the correction of a Class II molar relationship, the use of cervical headgear showed anterior displacement of the palatal plane with upward and backward vector of force that minimizes molar extrusion and prevents opening rotation of the mandible (7,8).

The purpose of this study was to evaluate the post-treatment results of nonextraction edgewise therapy combined with cervical extraoral force on Class II, Division 1 malocclusion in a growing patient.

CASE REPORT

The patient was an 11-year-old white boy with a mixed dentition Class II, Division 1 malocclusion with full cusp Class II relationship. Excessive overbite and overjet (13 mm) were also present (Figure 1).

The cephalometric analysis (Figure 2) indicated a Class II skeletal discrepancy (ANB = 6.5º) with the mandible positioned posterior relative to the cranial base (SNA = 82.5º, SNB = 76.0º). The sella-nasion to mandibular plane angle (SNGoGN = 31.0º) suggested a favorable mandibular growth direction. Incisors in the maxillary arch were protrusive ($\underline{1}$.NA = 39.5º, $\underline{1}$-NA = 10.5 mm), although there was no significant change in position of the lower incisors ($\overline{1}$.NB = 21.0º, $\overline{1}$-NB = 4.0 mm, IMPA = 88.0º).

The patient's face was symmetric on frontal view and convex in profile (LS-Ls = 5.0 mm, LS-Li = 1.5 mm). His lips were incompetent and protrusive relative to the esthetic plane (Figure 3). These findings

Correspondência: Profa. Dra. Mírian Aiko Nakane Matsumoto, Disciplina de Ortodontia, Faculdade de Odontologia de Ribeirão Preto, USP, Av. Café, s/n, 14040-904 Ribeirão Preto, SP, Brasil. e-mail: manakane@forp.usp.br

are summarized in Table 1.

A hand-wrist film (Figure 2) was taken to determine the patient's skeletal maturity with the method of Grave & Brown (9), when maxillary cervical headgear can be optimally used for orthopedic movement. This patient was at least 1 year before peak height velocity on the growth curve, so skeletal changes can be expected since this specific maturational period corrects Class II malocclusion to Class I with a higher degree of incremental growth velocity for maximum treatment response.

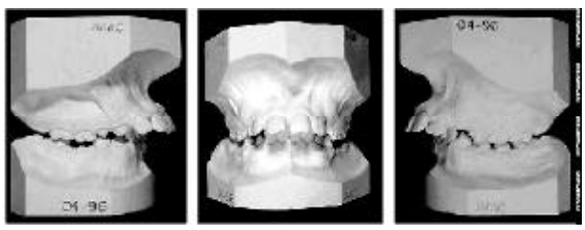

Figure 1. Pretreatment intraoral models.

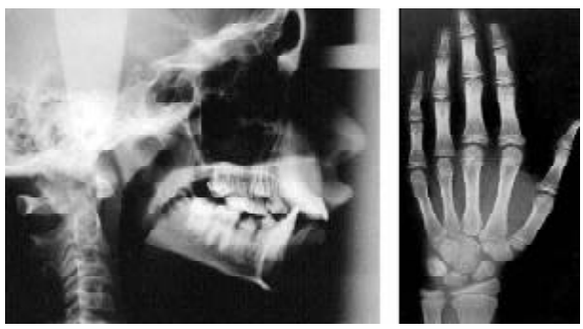

Figure 2. Initial cephalometric and hand-wrist radiographs.

Figure 3. Pretreatment facial photographs.

Treatment Plan

The goal of nonextraction edgewise treatment was to establish a functional Class I occlusion with improved alignment and facial esthetics. Cervical headgear was used with a fixed appliance, adjusted to deliver between 12 and 14 ounces to the neck strap force with a prescribed wear of 18-20 h per day to limit the anterior component of normal maxillary growth. The outer bow of the facebow was long to better control the axial inclination of the maxillary molars. The appliance was initially adjusted by leaving the outer bow straight along the occlusion plane, and then it was bent approximately 15° upward. The inner bow was expanded 2 mm symmetrically providing appropriate molar expansion.

The edgewise appliance was used to level the arches on a series of round wires. In the maxillary arch, the premolars and canines were retracted with elastomeric chain on a stopped 0.020 inch round wire, and the incisors were retracted with a 0.019 x 0.025 inch closing loop arch wire. Coordinated 0.019 x 0.025 inch wires were placed during the finishing stage. After 36 months of treatment, the appliance was removed and retainers were placed.

RESULTS AND DISCUSSION

Post-treatment photographs are shown in Figures 4 and 5. A Class I molar and canine relationship was obtained with improved overbite and overjet. Cephalometric analysis (Table 1) indicated a reduction in the maxillomandibular discrepancy (ANB) owing to down-

Table 1. Cephalometric summary.

Measurement	Standard	Initial	Final
SNA	82	82.5	79
SNB	80	76	76
ANB	2	6.5	3
SNGoGn	32	31	34
IMPA	88	88	88
$\underline{1}$.NA	22	39.5	20.5
$\underline{1}$-NA (mm)	4	10.5	5
$\overline{1}$.NB	25	21	28
$\overline{1}$-NB (mm)	4	4	6
LS-Ls (mm)	0	5	0
LS-Li (mm)	0	1.5	0

Figure 4. Post-treatment intraoral photographs.

Figure 5. Post-treatment facial photographs and final cephalometric radiograph.

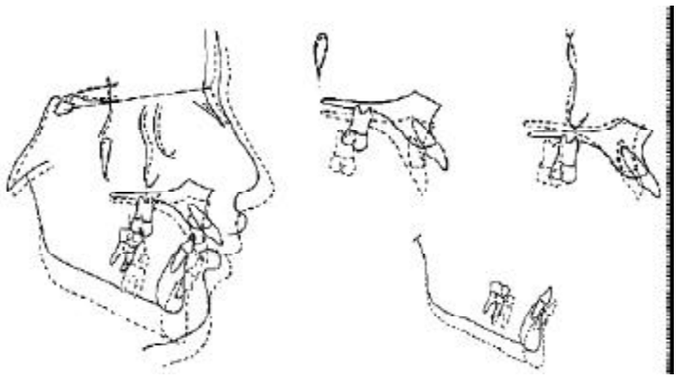

Figure 6. Cephalometric total and partial superimpositions.

ward displacement and inhibition of forward growth of the maxilla (10-13). However, downward rotation of the mandible was not observed because of compensatory growth on the ramus (14). There was no change in mandibular rotation that could be directly attributed to the cervical facebow. The vertical movement of the maxillary first molar was not significant (7,15-17), therefore the palatal plane showed downward displacement (7).

This treatment demonstrated that the period of greatest growth velocity is the best time for cervical headgear treatment to obtain a maximum orthopedic effect. The hand-wrist radiograph can be used in orthodontic treatment to determine a maturational period and to take advantage of the pubertal growth spurt. During the treatment, significant changes of growth were observed as seen on cephalometric superimpositions (Figure 6).

The cervical headgear treatment did not have a significant effect on the inclination of the incisors (5,18). However, in this patient the axial inclination of the maxillary incisors decreased. This may have been caused by efficient torquing with the edgewise appliance.

Facial esthetics were improved with reduced convexity of the profile and lip protrusion. However, the upper lip was thin and hypotonic resulting in separation of the lips at rest (Figure 5).

It is therefore suggested that the decreased horizontal overjet and the correction of the Class II, Division 1 malocclusion to Class I molar relationships are a result of changes in maxillary and mandibular growth as well as changes in dental inclinations. The edgewise appliance was used to correct dental inclination, rotation to obtain improved functional occlusion.

This study concludes that successful results can be attained with proper diagnosis and treatment planning. A favorable reduction of Class II skeletal problems can occur for patients in a broad range of skeletal severity and growth patterns. Patient cooperation in wearing the headgear for 18-20 h per day can explain the successful treatment response. Extraoral traction did not produce more extrusion of the maxillary molar and rotation of the mandible than that seen in normal dental eruption. The ANB correction was achieved with downward displacement of the maxilla and growth

of the mandible. There was improvement in the jaw relationship.

RESUMO

O tratamento precoce da maloclusão de Classe II foi realizado, alterando o padrão de crescimento, com o objetivo de corrigir a desproporção esquelética. Um caso de maloclusão de Classe II, Divisão 1 na dentição mista foi corrigido com terapia edgewise sem extração para uma relação molar de Classe I, usando o aparelho extraoral cervical. A análise cefalométrica indicou que a redução da discrepância maxilo-mandibular (ANB) foi corrigida de maloclusão Classe II para Classe I. O tratamento mostrou que isto foi possível devido ao deslocamento e inibição do crescimento anterior da maxila e crescimento mandibular. Não houve rotação horária da mandíbula, assim como, extrusão dos primeiros molares superiores. Houve melhora na relação maxilo-mandíbular.

REFERENCES

1. Meikle MC. The dentomaxillary complex and overjet correction in Class II, Division 1 malocclusion: Objectives of skeletal and alveolar remodeling. Am J Orthod 1980;77:184-197.
2. Aelbers CM, Dermaut LR. Orthopedics in orthodontics: Part I, fiction or reality - a review of the literature. Am J Orthod Dentofac Orthop 1996;110:513-519.
3. Baumrind S, Korn EL, Isaacson RJ, West EE, Molthen R. Quantitative analysis of the orthodontic and orthopedic effects of maxillary traction. Am J Orthod 1983;84:384-398.
4. Üner O, Dinçer M, Türk T, Haydar S. The effects of cervical headgear on dentofacial structures. J Nihon Univ Sch Dent 1994;36:241-253.
5. Kirjavainen M, Kirjavainen T, Haavikko K. Changes in dental arch dimensions by use of an orthopedic cervical headgear in Cass II correction. Am J Orthod Dentofac Orthop 1997;111:59-66.
6. Kopecky GR, Fishman LS. Timing of cervical headgear treatment based on skeletal maturation. Am J Orthod Dentofac Orthop 1993;104:162-169.
7. Cook AH, Sellke TA, BeGole EA. Control of the vertical dimension in Class II correction using a cervical headgear and lower utility arch in growing patients. Part I. Am J Orthod Dentofac Orthop 1994;106:376-388.
8. Hubbard GW, Nanda RS, Currier GF. A cephalometric evaluation of nonextraction cervical headgear treatment in Class II malocclusions. Angle Orthod 1994;64:359-370.
9. Grave KC, Brown T. Skeletal ossification and the adolescent growth spurt. Am J Orthod 1976;69:611-619.
10. Vaught RA. Treatment of a Class II Division 1 malocclusion. Am J Orthod Dentofac Orthop 2000;118:229-233.
11. Boecler PR, Riolo ML, Keeling SD, TenHave TR. Skeletal changes associated with extraoral appliance therapy: an evaluation of 200 consecutively treated cases. Angle Orthod 1987;59:263-269.
12. Cangialosi TJ, Meistrell ME, Leung MA, Ko JY. A cephalometric appraisal of edgewise Class II nonextraction treatment with extraoral force. Am J Orthod Dentofac Orthop 1988;93:315-324.
13. Elms TN, Buschang PH, Alexander RG. Long-term stability of Class II, Division 1, nonextraction cervical face-bow therapy: II. Cephalometric analysis. Am J Orthod Dentofac Orthop 1996;109:386-392.
14. Mair AD, Hunter WS. Mandibular growth direction with conventional Class II nonextraction treatment. Am J Orthod Dentofac Orthop 1992;101:543-549.
15. Fisher TJ. The cervical facebow and mandibular rotation. Angle Orthod 1980;50:54-62.
16. Kim KR, Muhl ZF. Changes in mandibular growth direction during and after cervical headgear treatment. Am J Orthod Dentofac Orthop 2001;119:522-530.
17. Gandini MREA, Gandini LGJ, Martins JCR, Santo MDSJ. Effects of cervical headgear and edgewise appliances on growing patients. Am J Orthod Dentofac Orthop 2001;119:531-539.
18. Kirjavainen M, Kirjavainen T, Hurmerinta K, Haavikko K. Orthopedic cervical headgear with an expanded inner bow in Class II correction. Angle Orthod 2000;70:317-325.

Accepted October 9, 2002